THE NÖRGAARD GRAVIMETER

A. B. ELEKTRISK MALMLETNING
(*The Electrical Prospecting Company*)
Kungsgatan 44, Stockholm (Sweden).

The essential feature of the Nørgaard Gravimeter consists of a nearly horizontal quartz pendulum supported on a horizontal torsion fibre of fused quartz fixed in a quartz frame. This whole system is immersed in a liquid and completely enclosed in a thick copper casing. A small glass window is provided in the casing through which the pendulum may be observed by means of a microscope and a system of mirrors.

The casing is very efficiently protected against outside temperature variations by thick insulation which eliminates the risk of error due to temperature gradients within the instrument.

The observations consist in measuring the angle of displacement from the horizontal of the quartz system about an axis parallel to the torsion fibre when the torque exerted by the pendulum due to gravity is balanced by a predetermined torque in the fibre.

This angle is measured by micrometer with an accuracy of approximately 0.3 to 0.4 seconds of arc, which corresponds to an accuracy in gravity determination of about 0.03 to 0.04 mgal for one observation.

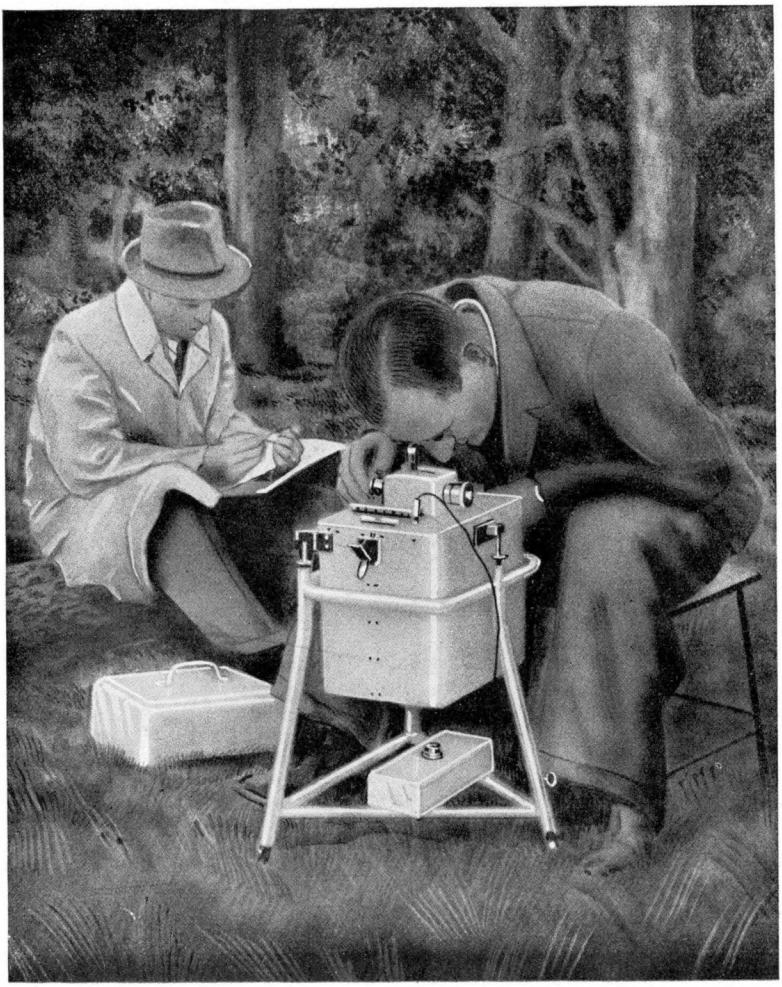
In field work, an accuracy of $\pm$ 0.014 mgal (expressed as the probable error of the mean of three determinations) has been obtained in the determination of the gravity difference between stations half a mile apart. When referred to one station only, this figure would be 0.01 mgal.

This high accuracy is due to the readings being unaffected by errors in levelling and above all to the extremely efficient compensation for temperature changes. Complete compensation can be provided for any convenient working temperature, but the necessary corrections within a range of 20 centigrade degrees (10° above or below this temperature) are so small that it is sufficient to take thermometer readings with an accuracy of 0.1 centigrade degree in order to achieve the accuracy in gravity determination mentioned above. Increasing the temperature range to 40 degrees reduces this accuracy to half which is still more than sufficient for general use.

The Nørgaard Gravimeter weighs 25 lbs. and the tripod 13 lbs. The overall dimensions of the instrument are: width 8 1/2", length 12" and height 16". It is a light and compact unit which does not require batteries and charging sets. It is easy to transport and unaffected by normal usage, although the quartz pendulum is never clamped.

The Nørgaard gravimeter has a small and steady drift and a small and simple temperature correction, so that it is well suited for use in place of pendulums for long-distance and geodetic surveys. The need for determination of "scale value" is eliminated, since the scale value is a function of the angle measured. The time for setting up, taking observations and moving out from the station is 4 to 5 minutes. The high speed and accuracy of the instrument and the small need for repetitions at base points are advantages which recommend its use also for commercial geophysical work.

(See: Geodaetisk Instituts Skrifter 3. Raekke, Bind VII, Copenhagen, 1946).



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